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[ANALYTICAL DATA ON PARTICULATE ATMOSPHERIC POLLUTANTS]

K. Asakuno, H. Yamazaki, Y. Inokoshi, T. Yamamoto and H. Shinozaki

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ANALYTICAL DATA ON PARTICULATE ATMOSPHERIC POLLUTANTS

Kunihiko Asakuno, Hiroshi Yamaziki, Yukio Inokoshi, Tatsuo Yamamoto
and Hoshiharu Shinozaki

TABLE 1. DIURNAL VARIATION IN CONCENTRATION OF PARTICULATE AIR POLLUTANT AND Mn AT H = 5m, 25m, 127m. (TOKYO TOWER. Aug. 1968)

Date	Time	5m		25m		127m	
		Mn ($\mu g/m^3$)	Total N(cm^3)	Mn ($\mu g/m^3$)	Total N(cm^3)	Mn ($\mu g/m^3$)	Total N(cm^3)
Aug. 19	10.00—12.00	0.23		0.21	34374		26937
〃	14.00—16.00	0.30		0.30	20995	0.21	7450
〃	18.00—20.00	0.16		0.13	5954	0.21	20995
〃	22.00—24.00	0.25		0.23	13604	0.45	38734
〃 20	2.00— 4.00	0.13		0.11	4054	0.13	12778
〃	6.00— 8.00	0.17		0.17	9822	0.36	10507
〃 21	10.00—12.00	0.16		0.12	28664	0.12	99887
〃	14.00—16.00	0.11		0.11	41353	0.09	99887
〃	18.00—20.00	0.34		0.32	20995	0.32	38734
〃	22.00—24.00	0.14		0.13	9184	0.11	23752
〃 22	2.00— 4.00	0.06		0.08	6390	0.08	11990
〃	6.00— 8.00	0.21		0.07	9822	0.06	16364

Mn = Radioactivation method

Concentration = Pollak counter 0.01 μm

Monthly [sic!] changes in the concentration of Mn for August 19-22, 1968, are indicated in Table 1. Mn measured by means of the radioactivation analysis method and all particulate matters larger than 0.01μ according to measurement with a Pollak counter are indicated with respect to 1 m^3 samples collected at the heights of 5m, 25m and 127m.

TABLE 2. DIURNAL VARIATION IN CONCENTRATION OF PARTICULATE AIR POLLUTANT AND RADIUS AT H = 25m, 127m.

(Tokyo Tower, Aug. 19-25, 1968)

N: Particle numbers R: Radius

Date.	Time	25m N	25m R	127m N	127m R
		(N/cc)	μ	(N/cc)	μ
Aug.19	12.00	34374	0.054	26937	0.052
	13.00	26937	0.060	41353	0.048
	14.00	17429	0.050	9850	0.048
	15.00	20995	0.048	14430	0.048
	16.00	30194	0.048	14430	0.043
	17.00	20995	0.035	16364	0.056
	18.00	16364	0.052	15371	0.082
	19.00	13604	0.040	20995	0.057
	20.00	14430	0.033	41353	0.040
	21.00				
	22.00	5954	0.056	32391	0.058
	23.00				
Aug.20	24.00	13604	0.050	38734	0.054
	1.00				
	2.00	5522	0.048	22248	0.048
	3.00				
	4.00	4054	0.060	12778	0.058
	5.00				
	6.00	5954	0.052	15371	0.065
	7.00	9822	0.045	11990	0.050
	8.00	8557	0.052	22248	0.042
	9.00	16364	0.045	22248	0.048

Date.	Time	25m N	25m R	127m N	127m R
		(N/cc)	μ	(N/cc)	μ
Aug.21	10.00	28664	0.044	99887	0.029
	11.00	41353	0.044	92105	0.048
	12.00	28664	0.040	74960	0.048
	13.00	36555	0.042	99887	0.035
	14.00	41335	0.044	99887	0.031
	15.00	36555	0.052	22248	0.054
	16.00	34374	0.033	36555	0.029
	17.00	36555	0.033	28664	0.021
	18.00	20995	0.040	38734	0.029
	19.00	17429	0.045	61791	0.056
	20.00	12778	0.045	46901	0.040
	21.00				
	22.00	9184	0.052	23752	0.048
	23.00				
	24.00	11990	0.044	19742	0.042
Aug.22	1.00				
	2.00	6390	0.042	11990	0.048
	3.00				
	4.00	2226	0.034	10507	0.026
	5.00				
	6.00	9822	0.035	16364	0.022
	7.00	8557	0.037	17429	0.025
	8.00	10507	0.042	22248	0.023
	9.00	12778	0.040	49908	0.022

Date.	Time	25m N	25m R	127m N	127m R
		(N/cc)	μ	(N/cc)	μ
Aug.24	10.00	92105	0.065	57190	0.030
	11.00	107822	0.023	49908	0.028
	12.00	99887	0.023	57190	0.023
	13.00	30494	0.030	32391	0.025
	14.00	4901	0.029	57190	0.022
	15.00	26937	0.031	49908	0.029
	16.00	30494	0.029	38734	0.048
	17.00	25255	0.031	26937	0.048
	18.00	20995	0.033	36555	0.026
	19.00	13604	0.030	23752	0.031
	20.00	7995	0.034	25255	0.026
	21.00				
	22.00	9184	0.024	26937	0.022
	23.00				
	24.00	4388	0.030	11203	0.077
Aug.25	1.00				
	2.00	3146	0.042	8557	0.038
	3.00				
	4.00	6390	0.040	5522	0.048
	5.00				
	6.00	10507	0.040	9184	0.051
	7.00	19742	0.030	22248	0.029
	8.00	12778	0.044	38734	0.038
	9.00	14430	0.048	49908	0.031

The concentrations and the radii of particulate pollutants at heights of 25m and 127m are indicated in Table 2. The concentrations were measured by means of a Pollak counter and the particle radii by means of the dispersion-separation method.

TABLE 3. VERTICAL TEMPORAL FLUCTUATIONS OF Mn AND Br ACCORDING TO THE RADIOACTIVATION ANALYSIS METHOD — Tokyo Tower, December, 1968

Date	Time	5m		25m		127m	
		Br ($\mu g/m^3$)	Mn ($\mu g/m^3$)	Br ($\mu g/m^3$)	Mn ($\mu g/m^3$)	Br ($\mu g/m^3$)	Mn ($\mu g/m^3$)
Dec. 3	14.00—16.00	0.361	0.52	0.266	0.45	0.289	0.34
〃	18.00—20.00	0.387	0.27	0.290	0.21	0.226	0.16
〃	22.00—24.00	0.169	0.45	0.233	0.24	0.252	0.18
Dec. 4	2.00— 4.00	0.371	0.20	0.321	0.12	0.230	0.20
〃	6.00— 8.00	0.275	0.26	0.310	0.11	0.213	0.31
〃	10.00—12.00	0.581	1.58	0.361	1.18	0.291	0.50
Dec. 6	10.00—12.00	0.306	0.40	0.249	0.42	0.222	0.32
〃	14.00—16.00	0.393	0.42	0.295	0.42	0.298	0.30
〃	18.00—20.00	0.593	0.16	0.529	0.06	0.316	0.11
〃	22.00—24.00	0.928	0.16	0.860	0.18	0.255	0.06
Dec. 7	2.00— 4.00	0.838	1.19	0.940	3.78	0.295	0.47
〃	6.00— 8.00	0.483	0.69	0.588	0.42	0.321	1.22
〃	10.00—12.00	0.274	1.40	0.332	1.26	0.335	0.52
〃	14.00—16.00	0.422	0.98	0.620	0.96	0.278	0.15
〃	18.00—20.00	1.000	1.67	0.632	0.87	0.090	0.22
〃	22.00—24.00	0.318	0.38	0.267	0.35	0.040	0.13
〃	2.00— 4.00	0.133	0.39	0.137	0.40	0.071	0.20
〃	6.00— 8.00	0.234	0.21	0.212	0.24	0.414	0.62

Diurnal changes in Br and Mn at 5m, 25m and 127m on the Tokyo Tower in December, 1968, are indicated in Table 3.

TABLE 4. MEASUREMENTS OF ATMOSPHERIC DUST BY POLLAK COUNTER - 1968

Time	Site	Height	R (%)	N (cc^{-})
9.05	Koiwa	3000	82	1117
9.07	Komatugawa	4000	84	897
9.09	Senju	4500	84	897
9.11	Ueno	4700	85	798
9.12	Harumi	4900	87	622
9.15	Kiba	5200	92	262
9.17	Arakawa-Kako	6000	91	325
9.20	〃	5800	86	705
9.24	〃	4500	83	1001
9.26	Edogawa-Kako	4900	84	897
9.28	〃	3000	83	1001
9.30	〃	2000	84	897
9.32	Kanda	1500	82	1119
9.34	Tower	〃	82	1119
9.36	Hamamatu-cho	〃	83	1001
9.40	Tower	〃	(turbulent) 83	1001
9.47	Hamamatu-cho	〃	(Flow) 67	4388
9.51	〃	〃	77	1854
9.53	Sinagawa-Station	〃	71	3146
9.56	Tamagawa-Ohashi	〃	(〃) 67	4388
9.58	Oi-cho-Station	〃	80	1377
10.02	Tamagawa-Ohashi	〃	(〃) 58	8557
10.07	Kawasaki	〃	58	8557
10.11	Kawasaki-Station	〃	58	8557
10.20	Shinagawa-Station	〃	59	7995
10.25	Harumi	〃	64	5522
10.28	Kiba	〃	65	5122
10.30	〃	〃	65	5122
10.40	〃	1000	60	7150

The results of observation of particulate pollutants from an aircraft are indicated in Table 4; it is seen that in the a.m. of December 11, 1968, the upper limit of pollution lies in the vicinity of 1,500 feet.

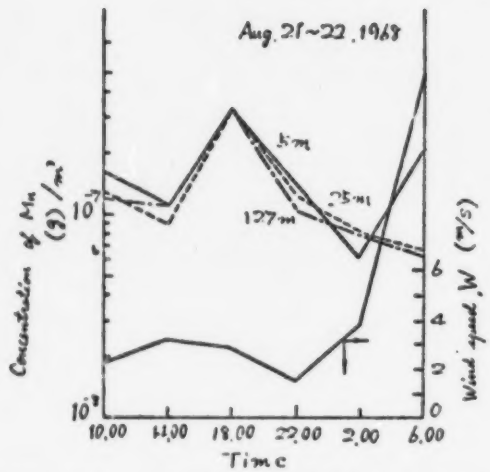

Figure 1. Diurnal variation in concentration of Mn at H 5m, 25m, 127m. (Tokyo Tower, Aug. 21, 22, 1968)

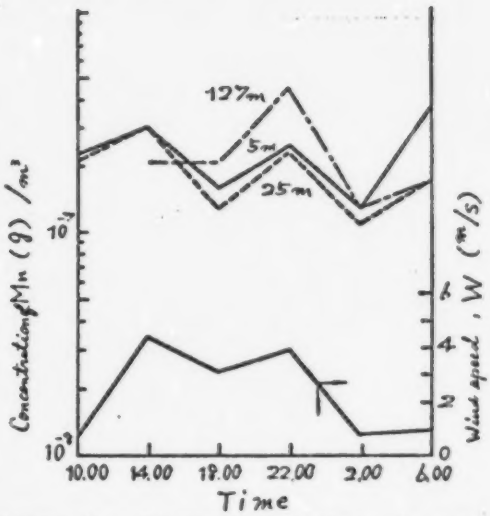

Figure 2. Diurnal variation in concentration of Mn at H 5m, 25m, 127m. (Tokyo Tower, Aug. 19, 20, 1968

Diurnal changes of Mn shown in Table 1 are indicated in graphs in Figure 1 and Figure 2. W is wind velocity recorded at the height of 107 m.

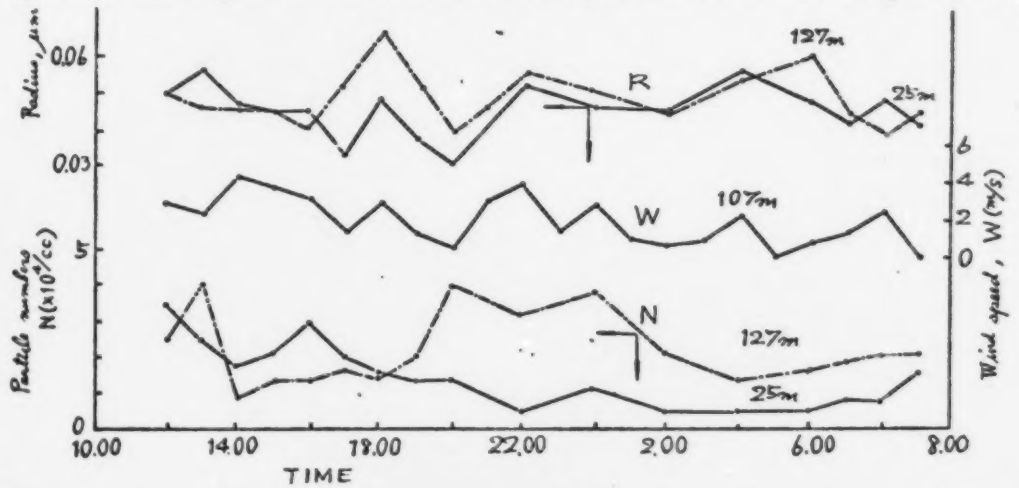

Figure 3. Diurnal variation in concentration and radius of particulate air pollutant at H 22m, 127m. (Tokyo Tower, Aug. 19, 20, 1968)

Table 2 is indicated in graphs in Figure 3 and Figure 4, for which the wind velocity was recorded at the height of 107 m. It is seen that the particle diameters increase as the wind weakens.

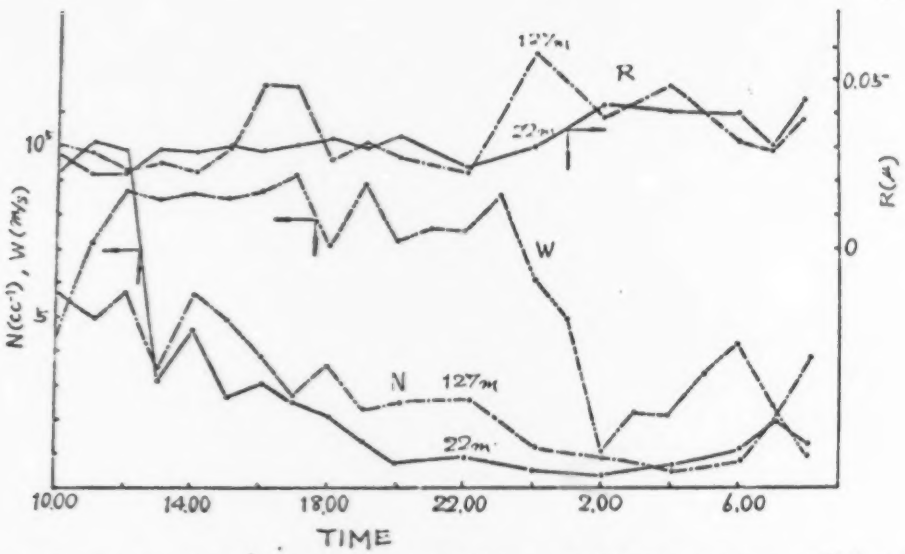

Fig. 4 Diurnal variation in concentration and radius of particulate air pollutant at H 25m, 127m. (Aug. 24-25, 1968. Tokyo Tower.)

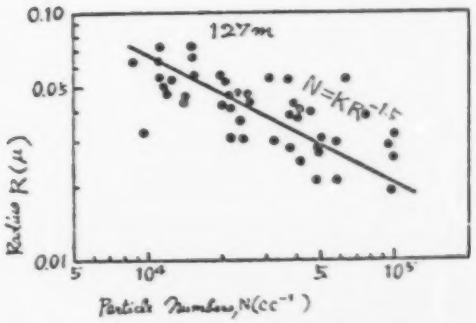

Fig. 5 Relation between concentration and radius for particulate air pollutant at H : 127m. (Tokyo Tower, Aug. 1968)

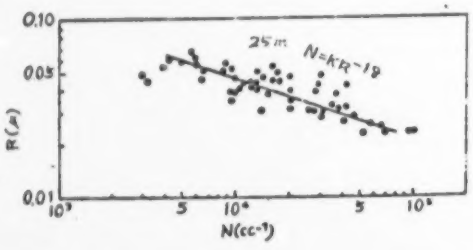

Fig. 6 Relation between concentration and radius for particulate air pollutant at H : 25m. (Tokyo Tower, Aug. 1968)

Table 2 is organized according to height in Figure 5 and Figure 6. The correlation between the concentration (number) of particulate pollutants and their radius varies according to height, and it is seen that the lower the height, the shorter the air-borne period.

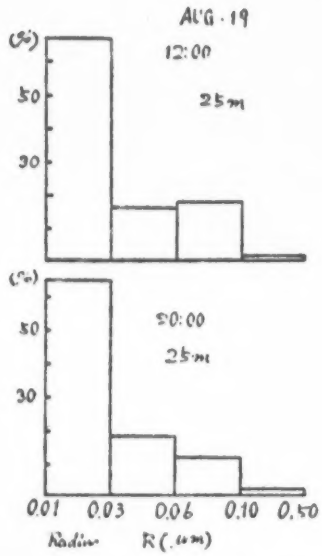

Fig. 7 Size distribution of particulate air pollutant at Tokyo Tower.

The particle diameter spectrum at the 25 meter point on the Tokyo Tower is shown in Figure 7. It was calculated according to the dispersion-separation method, and shows the distribution of the particle numbers.

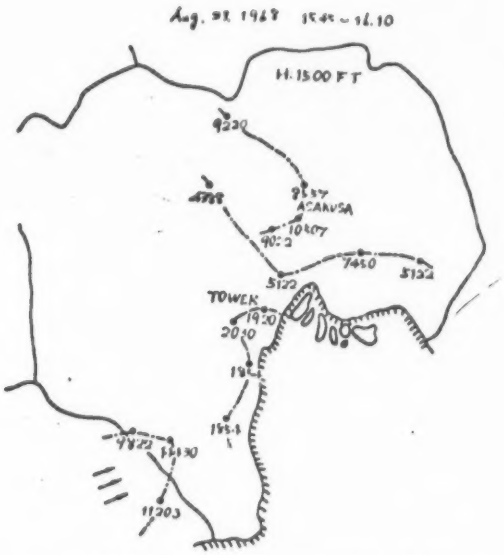

Fig. 8 Distribution in concentration of particulate air pollutant at H:1500ft. in Tokyo.

The distribution of the numbers of particulate pollutants at 1,500 feet over Tokyo in August, 1968, is shown in Figure 8.

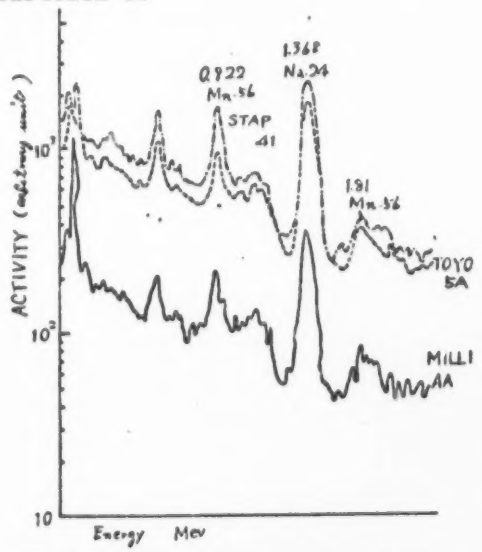

Fig. 9 Gamma ray spectra of several filters.

Figure 9 shows the radioactivation analysis measurements of the Mn and Na contents in filter papers used for the collection of samples for radioactivation analysis. It is seen that the Millipore AA is lower by 1 digit compared to the other filter papers.

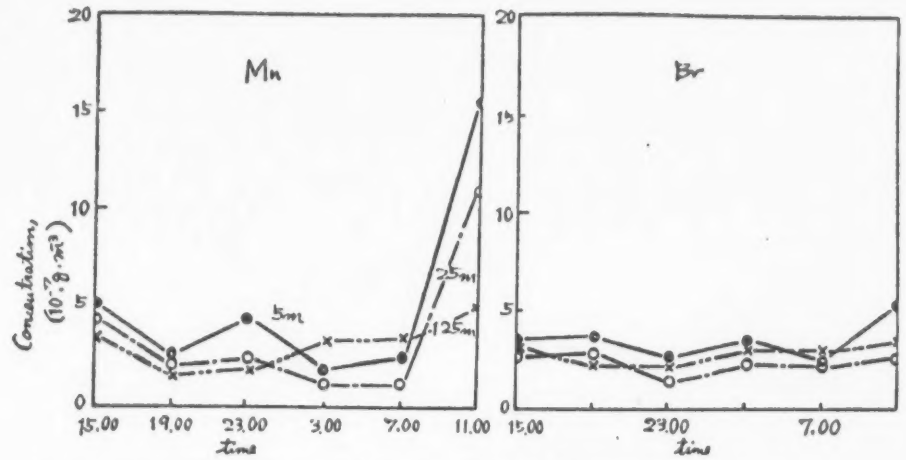

Fig. 10 Diurnal variation in concentration of Mn and Br at H : 5m, 25m, 128m.
(Tokyo Tower, Dec. 3—4. 1968)

Table 3 is indicated in graphs in Figures 10, 11 and 12. There is a considerable amount of fluctuation depending on the meteorological conditions, but the concentration becomes higher as the height becomes lower. Also, fluctuations of NO and SO_2 gases are shown in Figure 13 which indicates good correlations between Mn and SO_2 and Br and NO.

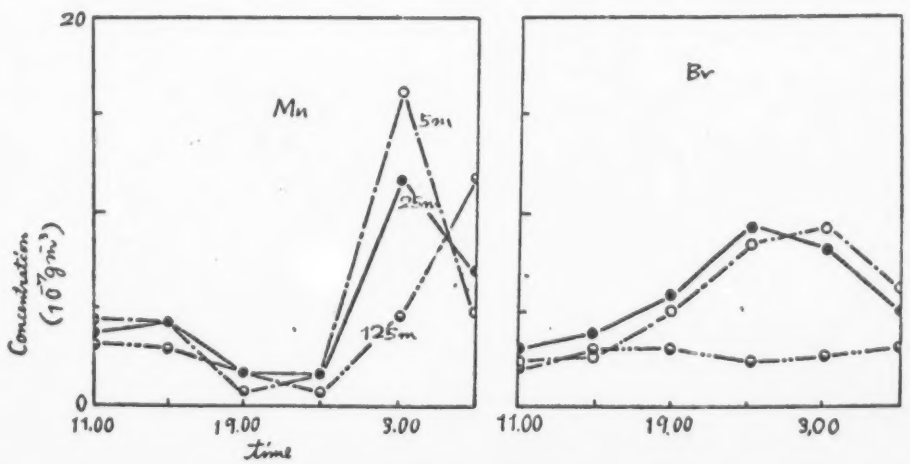

Fig. 11 Diurnal variation in concentration of Mn and Br at H : 5m, 25m, 127m.
(Tokyo Tower, Dec. 6 7. 1968)

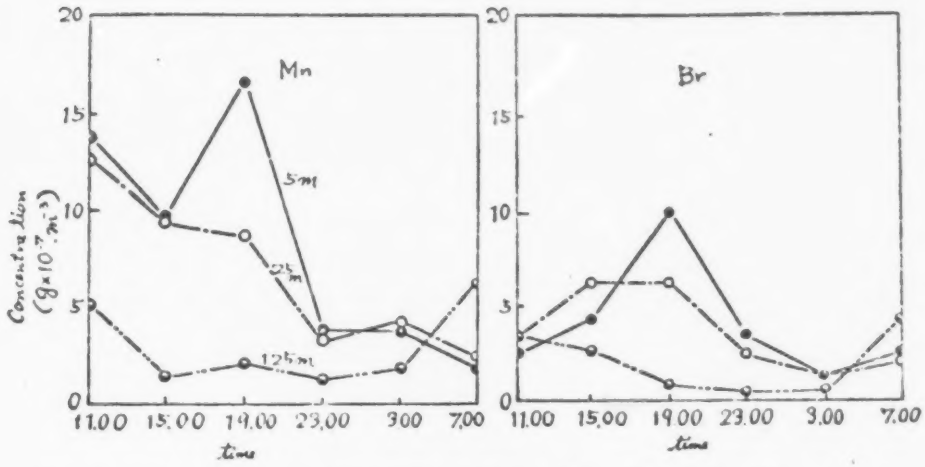

Fig. 12 Diurnal variation in conentration of Br and Mn at H : 5m, 25m, 127m.
(Tokyo Tower, Dec. 7—8. 1968)

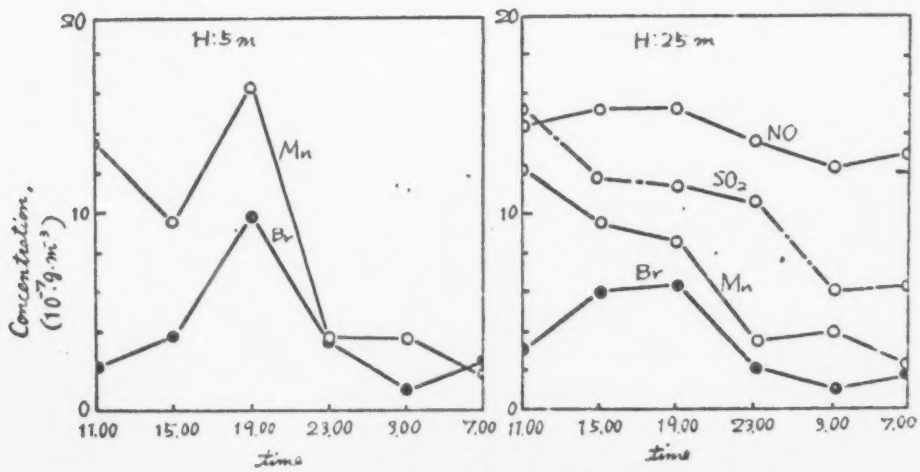

Fig. 13 Diurnal varition in concentration of Mn, Br, NO and SO_2 at H:5m, 25m.
(Tokyo Tower, Dec. 7—8. 1968